(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 October 2002 (03.10.2002)

PCT

(10) International Publication Number
WO 02/078260 A1

(51) International Patent Classification[7]: H04L 12/24, 12/52, H04Q 11/04

(21) International Application Number: PCT/SE02/00521

(22) International Filing Date: 19 March 2002 (19.03.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0101036-2 23 March 2001 (23.03.2001) SE
0102075-9 12 June 2001 (12.06.2001) SE

(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAG L M ERICSSON (publ)** [SE/SE]; S-126 25 Stockholm (SE).

(71) Applicant *(for US only)*: **WALDENFJORD, Mårten** [SE/SE]; Drevkarlsstigen 2, S-192 53 Sollemtuna (SE).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **YASSARATI, Akbar** [SE/SE]; Bankvägen 6, S-191 47 Sollentuna (SE).

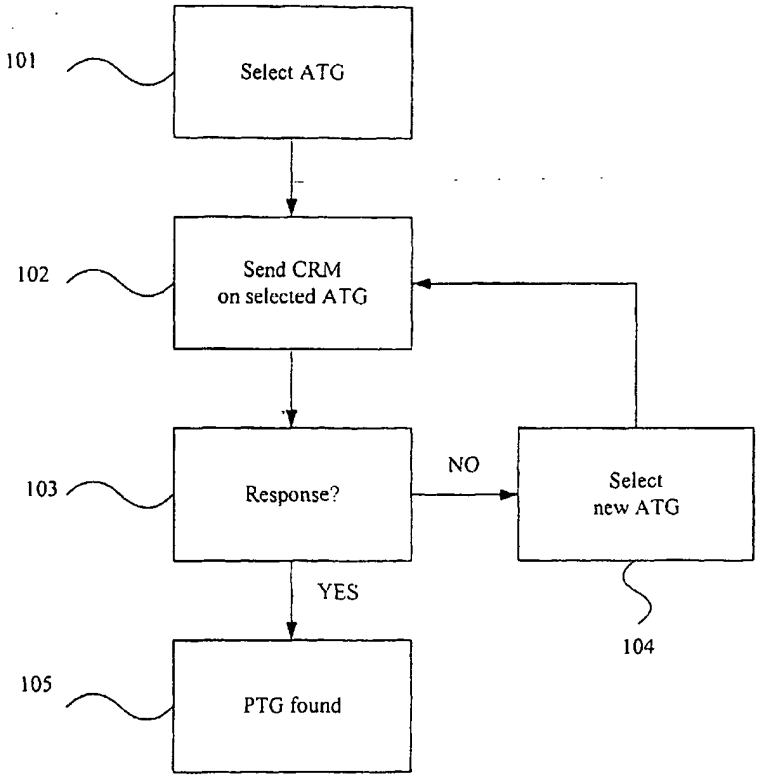
(74) Agent: **ALBIHNS STOCKHOLM AB**; P O Box 5581, S-114 85 Stockholm (SE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,

[Continued on next page]

(54) Title: METHOD AND ARRANGEMENT FOR AUTOMATIC CONFIGURATION OF NODE IN A TIMESLOT ORIENTED NETWORK



(57) Abstract: The invention presents a method for implementing a new node (B) in a network. An installed node (A) is adapted to be connected to the new node (B) via a timeslot oriented transmission link, and configured to establish a connection with the new node (B) using a pre-arranged timeslot group (PTG). The new node (B) sends a link layer configure request message (CRM) on a selected attempt timeslot group (ATG). Alternatively, the installed node (A) repeatedly sends, on the pre-arranged timeslot group (PTG), identical configure request messages. If the new node (B) does not receive a response or, alternatively, a configure request message, it selects a different attempt timeslot group (ATG). If the new node (B) receives a response or, alternatively, a configure request message it is determined that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

WO 02/078260 A1

GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:
— *with international search report*

Method and arrangement for automatic configuration of node in a timeslot oriented network.

TECHNICAL FIELD OF THE INVENTION

The present invention refers to a method and an arrangement for implementing a new node in a network, the new node in the network being adapted to be connected to an installed node via a timeslot oriented transmission link, and the installed node network being adapted to be configured to establish a connection with the new node using a pre-arranged timeslot group.

DESCRIPTION OF RELATED ART

Future implementations of wireless IP networks will consist of an increasing amount of routers, many of them embedded in radio base stations. The large amount of installation operations resulting from this requires new approaches to be applied to automatic address and node configuration. Routers that are introduced in the network must require a minimum amount of manually entered configuration information.

It is known to use central network servers, such as DHCP-, LDAP- and FTP-servers, to hold configuration data, making it possible for the introduction of new nodes in the network to be prepared for in advance. This way the introduction of new nodes is simplified. Booting nodes will fetch their configuration from servers in the IP-network.

To get the initial IP-connectivity, that is necessary in order to access the configuration servers, the booting nodes must configure the link layer automatically. This is usually no problem in the case the link-layer protocol is Ethernet. However, when the IP network consists of PPP connections built on timeslot oriented transmission links, it is not possible to start the link-layer protocol without knowledge about the

timeslot configuration on the link. For detailed information on the PPP, we refer to "The Point-to-Point protocol (PPP) RFC 1661".

In order to accomplish automatic set-up of PPP connections on fractional links, e.g. links where a number of timeslots are grouped together to constitute a channel, it is necessary to have a method making it possible to detect the timeslot configuration of the link automatically.

Currently, to start a PPP session requires knowledge about the timeslot configuration of the link. Today, every time a new node is introduced in the network, the configuration of the PCM fraction to be used by PPP must be configured in the node manually. The connecting node will send out configure request messages on the defined fraction and await an answer from the peer node. If no response is received from the peer node, the new, i.e. the connecting node will assume that the peer is temporarily down. In this state the new node will idle and wait for the peer node to re-start the link negotiation. The new node will stay in this state, even if the lack of response is due to a miss-configuration of timeslots on its own interface.

To illustrate the problem, we assume that an installed node is pre-configured and that a new node is about to set up its PPP connection with the network. Because the installed node is already configured and working it has tried to set up the PPP session with the new node. It has sent configure request messages but has not received any response, because the new node has been non-active. The installed node is now in Idle-state, in which it keeps sending HDLC Flags and listen to the line for a configuration request from the peer. When the installed node is in idle state there is a possibility that it stops transmitting HDLC flags and is active only on receiving side.

Because the new node is not aware of the configuration of the installed node, a method is required to determine what timeslots it must use in order to set up the PPP connection with the network.

A way to solve the problem for the new node would be to analyze all the timeslots of the incoming link and categorize the traffic. This would require the new node knowing exactly what types of traffic it may receive on the links, which could be anything, i.e. not only PPP. This method is thus not feasible for implementation, because of the high complexity in the algorithm. It is thus not considered a solution to our problem.

SUMMARY

It is an object of the present invention to decrease the amount of manual operations when installing a new node in a telecommunications network.

The object is met by a method and an arrangement for implementing a new node in a network, at which the new node sends a link layer configure request message on a selected attempt timeslot group. Alternatively, the installed node repeatedly sends, on the pre-arranged timeslot group, identical configure request messages. If the new node does not receive a response or, alternatively, a configure request message, it selects a different attempt timeslot group and repeats the procedure. If the new node receives a response or, alternatively, a configure request message it is determined that the attempt timeslot group is identical to the pre-arranged timeslot group.

The invention eliminates the need for manual specification of the timeslot configuration at installation time.

The method according to the invention could be used as a fallback or secondary alternative to manual configuration, at which it would be possible to recover from manual miss-configurations.

Also, the method according to the invention can be used to install a node before the network is up and running, the new node being located at the edge of the network.

At the time the network is configured, the new node and other nodes at the edge of the network can establish the PPP sessions automatically.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail, with the aid of the accompanying drawings, on which

- fig. 1 shows schematically an IP network,
- fig. 2 is a flow chart depicting steps in a method according to a first embodiment of the invention, and
- fig. 3 is a flow chart depicting steps in a method according to a second embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 shows schematically a part of an IP network NW comprising an installed node A, a new node B and a third node C. The network NW is adapted to establish PPP (Point-to-Point Protocol) connections built on timeslot oriented transmission links, and comprises a configuration data server CDS storing data for implementation of new nodes in the network. The configuration data server CDS could be a DHCP, LDAP or FTP type of server.

The term "installed node" should be understood as a node being physically installed. It could also be configured to establish the PPP sessions, but as will be described below, the invention is also adapted to a situation where the installed node A is not yet configured to establish the PPP sessions, for example, where the implementation of the new node B is commenced before the network is up and running, the new node B being located at the edge of the network.

The new node B and the third node C are to be implemented in the network NW. In a link L1 between the installed node A and the new node B, only some of the timeslots transmitted by the installed node A are destined for the new node B. The rest of the timeslots are intended to be received by the third node C. A time slot switch TSS in the new node B is responsible to switch the timeslots to the correct destinations. The timeslots switched to the third node C does not belong to the new node B.

As an example, we assume that the installed node A is pre-configured and that the new node B is about to set up its PPP connection with the network. Because the new node B is not aware of the configuration of the installed node A, a method is required to determine which timeslots it must use in order to set up the PPP connection with the network.

We here refer to fig. 2. The installed node A is configured to establish a connection with the new node B using an established group of timeslots, here referred to as a pre-arranged timeslot group PTG. According to a first embodiment of the invention, the connecting node, the new node B in fig. 1, selects an attempt timeslot group ATG on which to send a link layer configure request message, on the form of a PPP configure request message CRM, (see block 101).

The new node B sends the link layer configure request message CRM on the selected attempt timeslot group ATG, (block 102), and listens, during a predetermined listening time interval, for a PPP response from the configured node, i.e. the installed node A in fig. 1, (block 103).

If the new node B does not receive a response to the link layer configure request message CRM during the listening time interval, it selects a different attempt timeslot group ATG on which to send the link layer configure request message CRM, (block 104), and repeats the procedure.

If the new node B receives a response to the link layer configure request message CRM during the listening time interval, it can be determined that the attempt time-slot group ATG is identical to the pre-arranged timeslot group PTG, (see block 105). Thereby, it has found the timeslot group that can be used to establish the connection the installed node A.

Preferably, the attempt timeslot group ATG are selected according to a scheme stored in non-volatile memory of the connecting node, i.e. the new node B. The scheme is chosen to be suited for the network. According to a first aspect of the first embodiment, the scheme is adapted to reduce the number of possible timeslot groups by allowing only timeslot groups that contains multiples of a certain number of consecutive timeslots. According to a second aspect of the first embodiment, the scheme is adapted to protect some timeslots on the link that are destined to another node, e.g. the third node C in fig. 1.

Preferably, for the new/connecting node to be sure to find its peer, it loops through the scheme indefinitely. The reason for this is that, although the number of possible attempt timeslot groups is finite, and moreover, limited by the scheme for selecting them, there is a possibility of the connecting node not finding the pre-arranged time-slot group, despite having tried all timeslot groups indicated by the scheme. The reason could be, for example, a temporary non-availability of the installed node A. Another reason could be that, in the case the connecting node is installed before the network is up and running and the connecting node is located at the edge of the network, the peer of the connecting node is not yet properly configured.

We here refer to fig. 3. As mentioned above, the installed node A is configured with a pre-arranged timeslot group PTG, intended to be used to establish a connection to a node being added to the network, the new node B. According to a second embodiment of the invention, the installed node A is configured to continuously send PPP configure request messages. More specifically, the installed node A repeatedly

sends, on the pre-arranged timeslot group PTG, identical link layer configure request messages CRM, separated by a predetermined sending time interval.

According to the second embodiment of the invention, the new connecting node, the new node B selects an attempt timeslot group ATG on which to listen for the link layer configure request message CRM, see block 201. The new node B listens for the configure request message CRM on the selected attempt timeslot group, (block 202), during a predetermined listening time interval, being at least as long as the sending time interval. If it does not receive the link layer configure request message during the listening time interval, the new node B selects a different attempt timeslot group on which to listen for the link layer configure request message, (block 204), and repeats the procedure.

If the new node B receives the link layer configure request message CRM during the listening time interval, it can be determined that the attempt timeslot group is identical to the pre-arranged timeslot group, (see block 205). Thereby, it has found the timeslot group that can be used to set up the connection with the installed node A.

The scheme defining what fractions to test, which was described above in connection to the first embodiment of the invention, is applicable also in the second embodiment. Also, in a manner corresponding to what was described in connection to the first embodiment, the connecting node can loop through the scheme indefinitely.

CLAIMS

1. A method for implementing a new node in a network, the new node (B) in the network being adapted to be connected to an installed node (A) via a timeslot oriented transmission link, and the installed node (A) network being adapted to be configured to establish a connection with the new node (B) using a pre-arranged timeslot group (PTG), **characterized in** that it comprises the steps of
   a) selecting an attempt timeslot group (ATG),
   b) sending a link layer configure request message (CRM) on the selected attempt timeslot group (ATG), or on the pre-arranged timeslot group (PTG),
   c) listening for a response to the link layer configure request message (CRM), or for the link layer configure request message (CRM) itself, respectively,
   d) selecting, if a response to the link layer configure request message (CRM) or the link layer configure request message (CRM) itself, respectively, is not received, a different attempt timeslot group (ATG), and
   e) determining, if a response to the link layer configure request message (CRM) or the link layer configure request message (CRM) itself, respectively, is received, that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

2. A method for implementing a new node in a network, according to claim 1, **characterized by**
   a) the new node (B) selecting an attempt timeslot group (ATG),
   b) the new node (B) sending a link layer configure request message (CRM) on the selected attempt timeslot group (ATG),
   c) the new node (B) listening, during a predetermined listening time interval, for a response to the link layer configure request message (CRM),
   d) the new node (B), if it does not receive a response to the link layer configure request message (CRM) during the listening time interval, selecting a different attempt timeslot group (ATG), and repeating the steps b – d, and

e) the new node (B), if it receives a response to the link layer configure request message (CRM) during the listening time interval, determining that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

3. A method for implementing a new node in a network, according to claim 1, **characterized by**

a) the installed node (A) repeatedly sending, on the pre-arranged timeslot group (PTG), identical link layer configure request messages, separated by a predetermined sending time interval,

b) the new node (B) selecting an attempt timeslot group (ATG),

c) the new node (B) listening for the link layer configure request message (CRM) on the selected attempt timeslot group (ATG) during a predetermined listening time interval, being at least as long as the sending time interval,

d) the new node (B), if it does not receive the link layer configure request message (CRM) during the listening time interval, selecting a different attempt timeslot group (ATG), and repeating the steps c – d, and

e) the new node (B), if it receives the link layer configure request message (CRM) during the listening time interval, determining that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

4. An arrangement for implementing a new node in a network, the new node (B) in the network being adapted to be connected to an installed node (A) via a timeslot oriented transmission link, and the installed node (A) network being adapted to be configured to establish a connection with the new node (B) using a pre-arranged timeslot group (PTG), **characterized** by

a) the new node (B) being adapted to select an attempt timeslot group (ATG),

b) the new node (B) being adapted to send a link layer configure request message (CRM) on the selected attempt timeslot group (ATG),

c) the new node (B) being adapted to listen, during a predetermined listening time interval, for a response to the link layer configure request message (CRM),

d) the new node (B) being adapted to, if it does not receive a response to the link layer configure request message (CRM) during the listening time interval, select a different attempt timeslot group (ATG), send a link layer configure request message (CRM) on the selected attempt timeslot group (ATG) and listen, during the predetermined listening time interval, for a response to the link layer configure request message (CRM), and

e) the new node (B) being adapted to, if it receives a response to the link layer configure request message (CRM) during the listening time interval, determine that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

5. An arrangement for implementing a new node in a network, the new node (B) in the network being adapted to be connected to an installed node (A) via a timeslot oriented transmission link, and the installed node (A) network being adapted to be configured to establish a connection with the new node (B) using a pre-arranged timeslot group (PTG), **characterized** by

a) the installed node (A) being adapted to repeatedly send, on the pre-arranged timeslot group (PTG), identical link layer configure request messages, separated by a predetermined sending time interval,

b) the new node (B) being adapted to select an attempt timeslot group (ATG),

c) the new node (B) being adapted to listen for the link layer configure request message (CRM) on the selected attempt timeslot group (ATG) during a predetermined listening time interval, being at least as long as the sending time interval,

d) the new node (B) being adapted to, if it does not receive the link layer configure request message (CRM) during the listening time interval, select a different attempt timeslot group (ATG), and listen for the link layer configure request message (CRM) on the selected attempt timeslot group (ATG) during the predetermined listening time interval, and

e) the new node (B) being adapted to, if it receives the link layer configure request message (CRM) during the listening time interval, determine that the attempt timeslot group (ATG) is identical to the pre-arranged timeslot group (PTG).

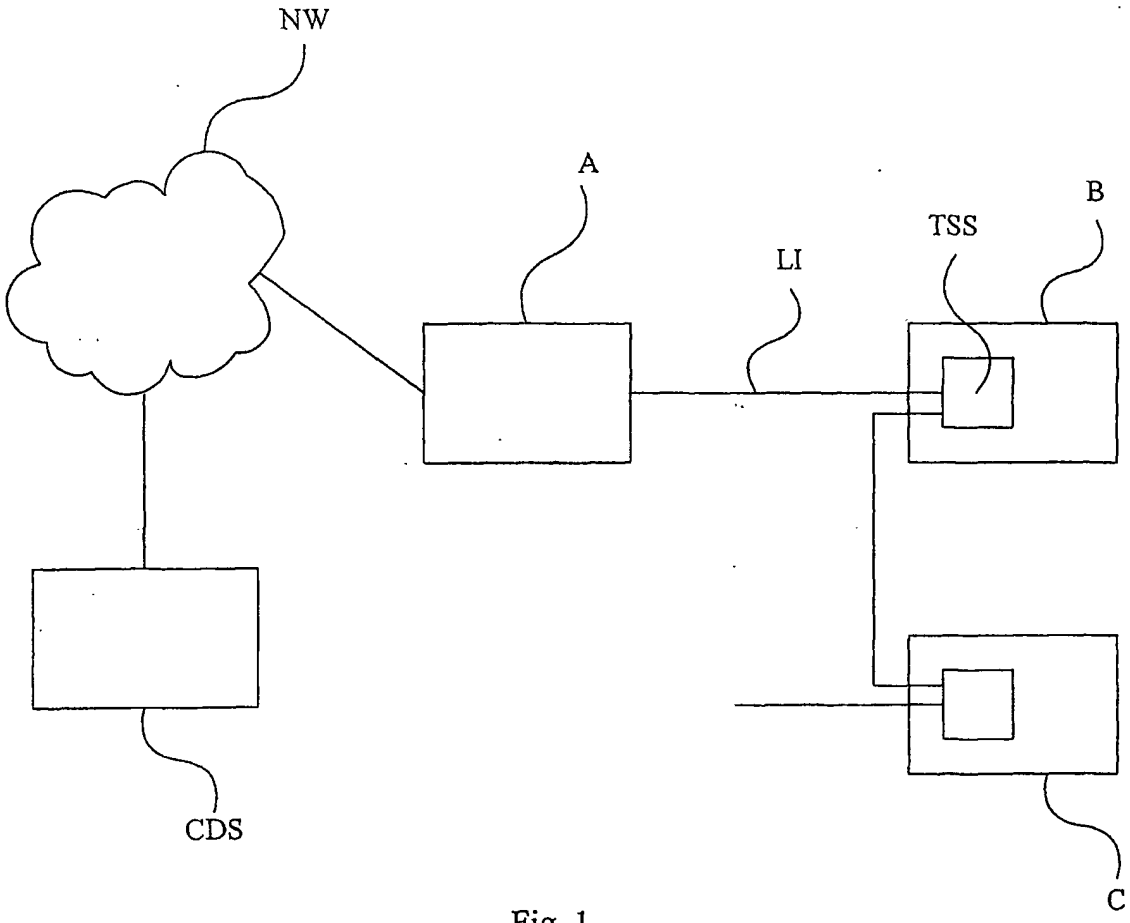


Fig. 1

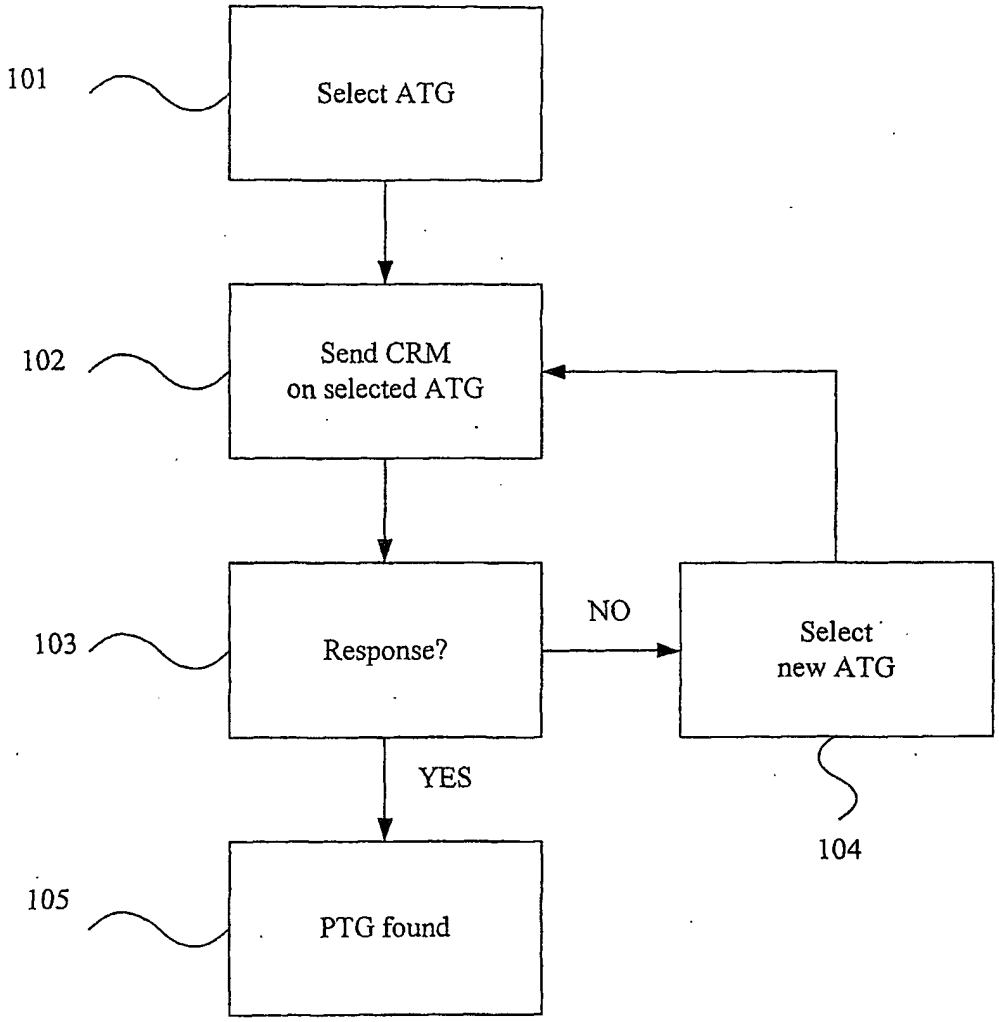

101
Select ATG
102
Send CRM
on selected ATG
103
Response?
NO
Select
new ATG
104
YES
105
PTG found

Fig. 2

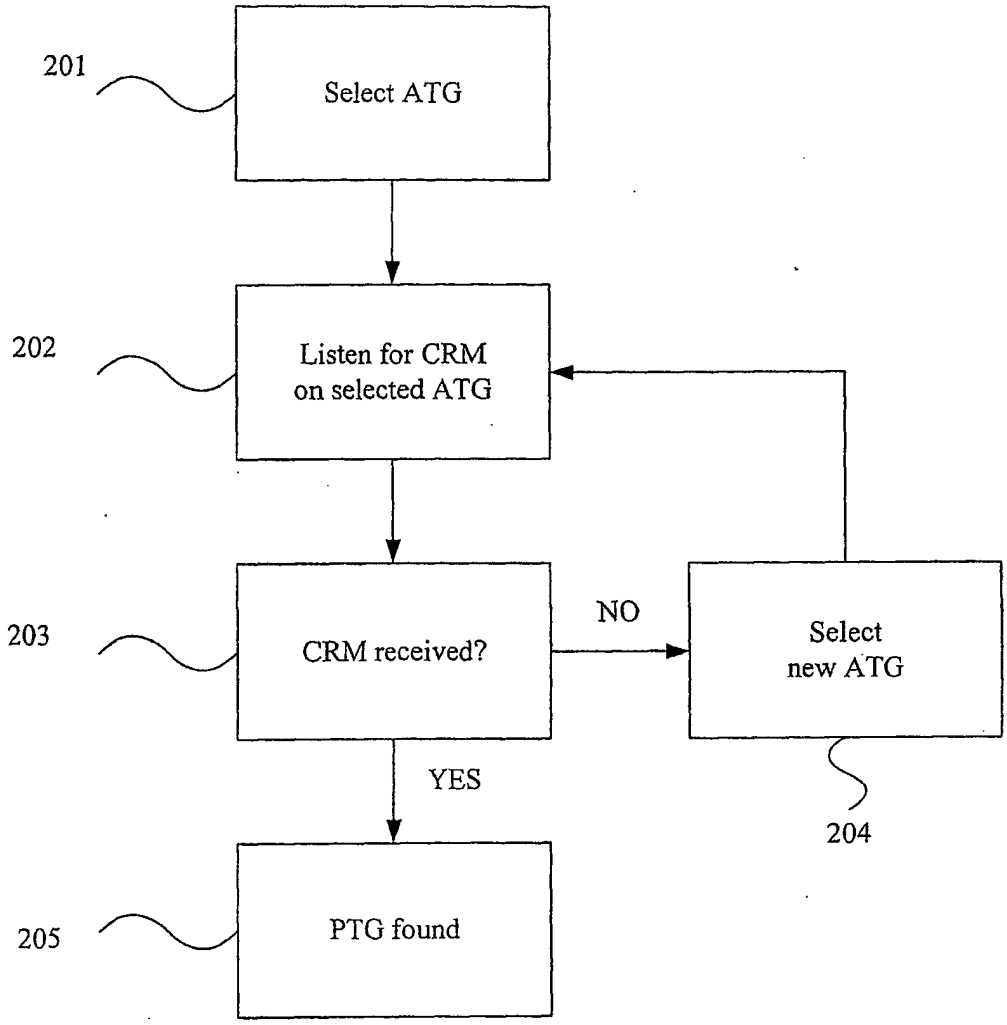

201
Select ATG
202
Listen for CRM on selected ATG
203
CRM received?
NO
Select new ATG
204
YES
205
PTG found

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/00521

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/24, H04L 12/52, H04Q 11/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04B, H04L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5453977 A (GEORGE H. FLAMMER, III ET AL), 26 Sept 1995 (26.09.95), column 2, line 39 - line 50; column 3, line 19 - line 29, abstract	1,2,4
Y	--	3,5
Y	Ericsson REVIEW, Volume 1, 2001, Juan Figueroa and Bill Guzek, "Cable modems-Broadband highway to the home" page 37, column 1, line 43 - column 2, line 6	3,5
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family.

Date of the actual completion of the international search	Date of mailing of the international search report
10 April 2002	01-07-2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Marianne Norrgren/mj Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/00521

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0079738 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 28 December 2000 (28.12.00), page 1, line 1 - page 8, line 19, figure 1, claims 1-4, abstract -- --------	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/SE 02/00521

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5453977 A	26/09/95	NONE	
WO 0079738 A1	28/12/00	AU 4633900 A	09/01/01
		EP 1188278 A	20/03/02
		SE 9902336 D	00/00/00
		US 2001054522 A	27/12/01